

FLIGHT

The
AIRCRAFT
ENGINEER
&
AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

1922.
 Aug. 6-20 French Gliding Competition
 Aug. 6 Gordon-Bennett Balloon Race, Geneva
 Aug. 7 Aerial Derby Starting at Waddon
 Aug. 12 Schneider Cup Seaplane Race, at Naples
 Sept. Tyrrhenian Cup, Italy
 Sept. Italian Grand Prix
 Sept. or Oct. R.Ae.C. Race Meeting, at Waddon
 Sept. 22 Coupe Deutsche (300 kil.)
 Dec. 15-
 Jan. 2 Paris Aero Exhibition

1923.
 Dec. 1 Entries Close for French Aero Engine Competition
 1924.
 Mar. 1 French Aero Engine Competition.

INDEX FOR VOL. XIII.

The Index for Vol. XIII of FLIGHT (January to December, 1921) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 1s. per copy (1s. 1d. post free).

EDITORIAL COMMENT.

It seems but a short while ago, and in point of fact it is only a matter of a little over ten years, that the majority of aeroplanes, and practically all the aero engines, used in this country were of French design and, mostly, of French construction. With the advent of the 50 h.p.

Gnome an enormous impetus was given to the progress of flight, owing to the, for the time, very light weight for the power developed. Soon the Gnome became the fashion, and few thought of fitting anything else. So deeply rooted became the habit of thinking of aero engines and French aero engines as synonymous terms that, even so late as the outbreak of war, found us with but a very few British firms producing aero engines of their own design. Then came the War and its demands, which necessitated the production of British engines in large quantities. A large industry was built up, and at the cessation of hostilities British engines were generally superior to those of any other country.

Since 1919 but a very few engines have been ordered by the Air Ministry, and the number which can be absorbed by our so-called commercial aviation activities is negligible. There is very grave danger that, without Government support, more than one of the aero engine firms which established reputations during the War will have to close down their works. In the general way, keeping an aero engine factory going is far more difficult and costly than is the keeping alive of an aircraft factory. This fact sometimes appears to be lost sight of. France is offering a million francs for an aero engine. We are doing nothing. Not only so, but engines which have shown real merit and progress are allowed to remain unused.

To take one example, which is illustrative of the way in which lack of foresight on the part of the Government is forcing the industry to the wall, the Bristol "Jupiter" is now to be manufactured in France, by the Gnome and Rhone Company, after having passed the French engine tests with flying colours. The "Jupiter," upon the development and perfecting of which very large sums of money have

**The
Bristol
"Jupiter"
in France**

been spent, passed the Air Ministry type test some months ago. Incidentally it was the first radial air-cooled engine to do so. Yet no orders were forthcoming. The engine had satisfied all the requirements of the Air Ministry, but, except for isolated cases, there was no money available, apparently, for placing an order with the makers for a few engines.

Seeing this the Bristol Aeroplane Co., Ltd., decided that something had to be done if all the work and money spent so unstintingly on its development were not to be entirely wasted. The result is that now, after having passed without difficulty the French tests—including five 10-hour periods of non-stop running—the "Jupiter" will be manufactured in France and used on French military and commercial machines. In the old days the position was bad. We bought French aero engines, but we bought them because there were at the time no British engines which could compete with them. Today the position is ten times worse, because, although we have the engines, we do not make use of them, leaving that to our French allies. One would have imagined that the lesson of the War would not have been forgotten so soon, but apparently it has. If something is not done, and done quickly, not only this firm but others who have produced engines of world-wide fame will undoubtedly be forced to close down. And the next time we want engines there will not be time for us to muddle through as we did in the last. Aircraft attack on a large scale will settle matters before the national character has had time to assert itself. It is almost grotesque in its baldness, and is pathetic in its tragic possibilities.

The Paraffin-cum- Hydrogen Airship Engine

In view of the apathetic attitude taken towards existing engines of recognised types, we are forced to ask the question: Is it likely that support will be forthcoming for new developments which, although promising very considerable ultimate gains, will necessarily involve the expenditure of certain sums of money during the experimental stage? Frankly, unless the Government is forced by public opinion, we doubt if the necessary funds will be granted—or "lifted"—in these days of misguided economy. There are a number of problems awaiting solution, among which mention may be made of the Diesel or semi-Diesel type of engine for aircraft work; the increase in aero engine efficiency which has been proved by Mr. Ricardo to be possible by the admittance to the engine cylinders of a layer of inert gas above the explosive charge, thereby maintaining the high compression and thermal efficiency, even when the engine is run throttled down; and, finally, the very great advantage which arises from the use of hydrogen in combination with liquid fuel for airship propulsion.

The last-mentioned problem has received a certain amount of publicity recently, a statement having

appeared to the effect that engines of this type are suggested for the airship services which Commander Burney, in connection with Vickers, Ltd., and the "Shell" group, propose to organise. As the account given in the daily Press suffers from certain inaccuracies, it appears well briefly to place on record the facts relating to the development of engines of this type.

It is not quite clear who was the first to suggest hydrogen as a fuel, but at any rate it is known that in 1918-19 the experimental staff at Pulham airship station were engaged on work along these lines, and we believe that as a matter of fact Commander Boothby holds a patent of the main idea, while other officers who were at Pulham at or about that time hold a patent for a carburettor which makes the application of the idea satisfactorily possible.

Then came the closing down of Pulham, and the scheme had perforce to be dropped, as far as the officers there engaged were concerned. Thus, although it was not generally known, the closing down of that airship station had immediate results quite apart from those arising out of letting our airship material "rot in its sheds." And still the Secretary of State for Air can get up in public and unblushingly suggest that we may as well leave airships and all questions relating to them alone for the next ten years.

All technical officers and civilians who had had experience of airship work realised that, although the use of hydrogen constituted a danger from fire, the greatest danger was a result of using petrol as a fuel. Escaping hydrogen is quickly dispersed, but petrol vapour has an unpleasant habit of hanging about for quite a long time. They realised as an obvious fact that, from this point of view alone, the employment of a heavier fuel would be a very great advantage. By combining a heavier fuel with hydrogen, not only is the fire danger greatly reduced, but a very great economy and increase in carrying capacity of paying load results, and the production of an engine which will combine these two fuels may well have the most far-reaching effects upon the future of airships.

After the regrettable accident to the "Roma," Commander Boothby thought that something ought to be done to make further progress with the hydrogen scheme. He consequently approached the "Shell" company, whose chemical expert, Mr. Kewley, in conjunction with Mr. Ricardo, set to work upon the problems, with the result that a practicable engine burning heavy paraffin in conjunction with hydrogen is now within sight. If the Burney airship scheme is approved, and with the Admiralty offer, it can hardly be doubted that it will be approved, presumably the paraffin-cum-hydrogen engines will be part of it. Thus this problem appears in a fair way of being solved without Government encouragement. But the others are likely to remain unsolved, unless our fatal policy of starving research is changed very speedily.

The Grand Prix de l'Aero Club de l'Ouest

CLOSE upon forty aeroplanes took part in the Grand Prix, which was flown over a triangular course on July 2. The three turning points were Angers, Cholet and Saumur, with start and finish at Angers. Competitors had to make two laps of the course, bringing the total distance up to 315 kilometres (about 195 miles). The military competition, which was flown under the same rules, was divided into two series. The competition was, in a sense, a speed test, although relatively slow machines were used, owing to the fact that marks were awarded for each passenger

carried. In the civilian section, first prize was won by Jean Casale on a Spad 46 with 370 h.p. Lorraine-Dietrich engine. His actual flying time was 1h. 58m. 33s. (handicap time 1h. 31m. 52s.). Sadi Lecoq, who was flying a Nieuport limousine with 300 Hispano, was second, with a flying time of 2h. 32m. 7s. (handicap time 2h. 4m. 17s.). The military section was won by Lieut. Borde in 1h. 39m. 3s. Lieut. Thoret was second, his handicap time being 1h. 39m. 30s. The Grand Prix was witnessed by numerous spectators and must have helped greatly to increase popular interest in flying.

THE HEATH SPORT-PLANE

THE problem of designing and constructing a successful small, low-powered sporting aeroplane is undoubtedly a very interesting one, and this week we record an effort in this direction, once again hailing from America, where this type of machine receives no small amount of attention. The machine in question, called the "Feather," has been built by the Heath Aeroplane Co., Inc., of Chicago, to the designs of Mr. E. B. Heath. Unfortunately, detailed particulars of this little 'bus are lacking at the moment of writing, but we give herewith some illustrations and the principal characteristics.

As will be seen, it is a single-seater tractor biplane of more or less conventional lines, having a single pair of struts each side and a healthy three-wheeled landing chassis. The fuselage is of good streamline form, and it will be noticed that the ailerons, fitted to the top planes only, are of substantial proportions, no doubt a desirable feature on a small span machine (24 ft.).

It is fitted with a 2-cyl. air-cooled "Thor" (Model 15A) motor-cycle engine—for which the machine was specially designed—modified in certain details to meet the requirements of aerial work. For instance, specially heavy gears have been fitted, the gear reduction being $3\frac{1}{2}$ to 1. The engine speed is in the neighbourhood of 3,000 r.p.m.

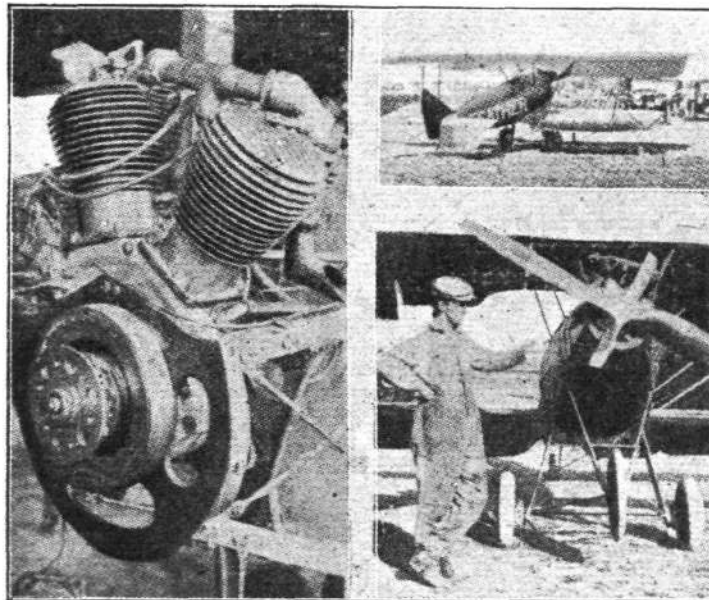
A somewhat novel feature is to be found in the air screw employed on this machine. It will be seen on reference to the illustrations that two small blades are built into the screw at right angles to the blades proper. These auxiliary blades are provided for the purpose of increasing the slipstream over the engine cylinders, thus assisting in the cooling of the latter. It is stated that this arrangement is only necessary in the summer months, and for the cool weather an ordinary two-bladed screw, 6 ft. 6 ins. diameter by 5 ft. 6 ins. pitch, is employed.

We understand that trial flights have been carried out with this machine, and that it flies remarkably well.

The principal characteristics of the "Feather" are as follows:—

Span	24 ft.
Overall length	18 ft.
Overall height	6 ft. 6 ins.
Chord	4 ft.
Gap	4 ft.
Stagger	15°
Dihedral angle (lower)	1½°
Angle of incidence	4°
Area of main planes	165 sq. ft.

Area of ailerons	20 sq. ft.
Area of tail plane	5 sq. ft.
Area of elevators	7 sq. ft.
Area of fin	2½ sq. ft.
Area of rudder	4 sq. ft.
Weight empty	350 lbs.
Weight loaded	550 lbs.
Wing loading	3½ lbs./sq. ft.
Power loading	27½ lbs./h.p.
Speed range	29-60 m.p.h.
Climb	800 ft./min.
Ceiling	5,000 ft.
Range (full speed)	55 miles.



THE HEATH SINGLE-SEATER SPORT-PLANE: Some details. On the left a view of the 20 h.p. Thor motor-cycle engine. On the right, bottom, the tractor screw with auxiliary blades for cooling the cylinders. Above, a three-quarter rear view of the machine.



The Heath
Single-Seater
Sport - 'Plane:
Three - quarter
front view.

The Coupe Deutsch

IF rumour is to be trusted, there appears to be reason for expecting that this year's Coupe Deutsch, which will be flown over the Villesauvage (Etampes)-la Marmogne course on September 22, may be somewhat more interesting than has been the case hitherto. On dit that Sadi Lecointe and Lasne will fly Nieuport machines. Brack Papa will probably be there with his 700 h.p. Fiat, and it is reported that such famous French pilots as Kirsch (last year's winner), Madon, Canivet and Jean Casale will be entered for the elimination

trials, all mounted on new machines. From this country we hope to see at least two entries. One will almost certainly be James on the Gloucestershire Mars I, which will have been considerably "cleaned up" by then, and another possible starter is a new Bristol, designed by Mr. Reid, about which no information may be published at present. It is not yet known if America will be represented, but there is, apparently, a possibility that one or two really fast machines from "the other side" will turn up. Altogether considerable interest should attach to the Coupe Deutsch this summer.

ROYAL AERO CLUB'S COMING OF AGE

MEMBERS of the Club entertained at the Savoy Hotel a distinguished company at dinner on June 27, to celebrate the twenty-first anniversary of the forming of the Royal Aero Club. The Duke of Atholl, President of the Club, presided, and after proposing a vote of condolence, which was accorded to Lady Wilson on the tragic death of her husband, announced that he had authorised the despatch of the following message to Lord Stamfordham, the King's Private Secretary:—

"The Royal Aero Club assembled together to celebrate the twenty-first anniversary of their existence, send your Majesty loyal and respectful greetings humbly submitted by the Duke of Atholl, President."

Later in the evening it was announced that the following reply had been received:—

"His Majesty commands me to thank the Royal Aero Club for their loyal message, and in return, while he congratulates them on the splendid work in the cause of British aviation, he wishes them all success in the future."—Stamfordham.

Lord Gorell, Under-Secretary of State for Air, in the unavoidable absence of Capt. F. E. Guest, Secretary of State for Air, proposed the toast of "The Royal Aero Club," and declared that though in some respects the aerial position, both Service and civil, had been passing through times of difficulty, there was no real need for depression. It was not so many months since the Government had declared the Air Force independent of the other forces of the Crown. The air had gradually become an element which no one could disregard. In the very short history of aviation the Royal Aero Club had played a conspicuous part, and it was recorded that between 1909 and 1914 the club spent upward of £60,000 for the encouragement of competitions and the development of flying. He wished the club long life and great prosperity.

The Duke of Atholl, responding to the toast, said the club, from a very small beginning, had come to be recognised as the headquarters of British flying. He said that advisedly, for to their friends of the Royal Aeronautical Society they left the scientific side. Long before Dr. Coué was heard of they used to say, "Every day and in every way our flying gets better and better." British grit and scientific knowledge had done everything for British aviation, but today there were crass idiots so financially and strategically blind as to think that the salvation of this country lay in the starving of a force which beyond question stood between us and disaster in the initial stages of a war. It was for the people of this country to see that the false economists did not deplete our safety through wrong ideas of thrift. Flying, which was still in its infancy, could not be kept up unless it was backed by the Government, and the experience of the late war taught us that to be saved we must be prepared. Those who were interested in aviation did not ask for fleets and squadrons of aircraft, but they did ask that encouragement should be given to civil aviation to ensure that the best inventive brains in the industry should not be wasted. No institution had done more to keep this view before the public than the Royal Aero Club, from the days when flights were measured in seconds and occasionally in minutes. Today their chief activity was in promoting competitions, and they were most grateful to the King for the lead he had given them by presenting a cup for their next big competition.

Lord Weir afterwards delivered an address on aviation. If they were to believe one section of the Press, he said, British aviation was practically dead. Narrow and unimaginative people were said to have ruined it. It seemed to him that these newspaper critics were no better informed than the lady who could not remember the name of the Derby winner, but was able to say that Donoghue was the name of its caddie. He could recall no subject which had received more real help from the majority of the newspapers of this country than aviation, and even if Press criticisms were uninformed at times, they did good because they stimulated public interest. So far as he could gather, the main line of recent criticism was that we were falling into a dangerously weak position in comparison with France; that civil aviation, upon which we must largely rely, had declined, and that the British aircraft industry was practically ruined. He held a profound conviction that the country which, in the war, did more effective and greater work in the air than any other country, would continue to hold a position of supremacy in the air, in keeping with its great position amongst the nations of the world.

In regard to France's squadrons, he refused to conjure up visions of menace—he preferred to recall that France owed us £500,000,000. If the interest on that was assessed at £25,000,000, was it not a legitimate reflection that we had

in effect paid for those 220 squadrons? It had to be remembered, too, that a French squadron cost but a quarter that it cost to maintain a British squadron. He was inclined to reflect that if taxation was the price of Admiralty, then indeed we had paid in full.

He urged that in regard to the Service votes the question of national defence should be considered a single problem, and the distribution of the vote decided by the best results from the economic standpoint. If that were done there would be no fear for the Service side of British aviation.

In any calm and dispassionate appraisal of relative effectiveness for national defence, the air would justify more easily year by year its claim for more and more substantial consideration. All he would suggest was that its claims be given calm and dispassionate consideration, and that national defence be the predominant factor rather than the interests of any of the three Services. It was because he thought our Government was in the fortunate position of being able to have the case for the air separately presented to them to secure proper consideration, that he was one of those who believed we did the right thing in becoming the first nation, and even today the only nation, to have a separate Air Service. When Great Britain was charged with lack of imagination in regard to the air, that at least should be reckoned in its favour.

He was convinced that the services of aviation should be considered entirely apart from the civil side for some time to come. It was not wise for the Royal Air Force to rely in any way on civil air transport as a reserve in times of emergency; he could find nothing in the development of civil air transport that could be regarded as offering effective assistance to the fighting services. He had a feeling that the commercial aeroplane would, as it developed into an economic success, become in its design and structure of less and less value as a weapon of war. He hoped that the successful aeroplane of the future would be as useful for bomb-dropping and purely offensive purposes as the "Mauretania" might have been at the Battle of Jutland.

The most discouraging experience of private enterprise today was the apathy of the travelling public. According to the newspapers, the community called for more and more aeroplanes, but they were not using the aeroplanes that were in existence. The simple way of helping British air transport was to use the service provided and so help its development. It was to countries like their own that they must look for any development, and they must look to their designers and scientists for a real basic solution of commercial air transport. It was a matter for the technician and engineer, and if we spent our money with that end in view we should be repaid a hundredfold. He regarded the exhibition at Hendon last Saturday as a great performance. It suggested to him new hope for the aircraft industry. The Royal Air Force must not live much longer on the old war machine. There need be no fear for British aviation if there was first given a calm and dispassionate judgment on the effectiveness of the air as an arm of national defence; next the maintenance by State support of our administrative civil air services, and perhaps an expansion to the Cairo-India route; further, a practical appreciation of the necessity of supporting technical development and research; and finally, an active policy of replacement of the old Service type of machine.

M. Flandin (President, Aero Club de France) addressed the company on aviation, and was followed by Vice-Admiral Sir Roger Keyes, who said that the Air Force was an essential protection for these islands, because attacks from the air could not be met by any other Service. As a member of the Board of Admiralty, he said that body looked to an efficient air service in maintaining sea supremacy. An inferior fleet equipped with an efficient air service would be a serious menace to a superior fleet lacking such equipment. The power of the Navy to maintain the sea supremacy of the Empire was vitally dependent upon the efficiency of its air units. The Empire would fail to exist when its sea power failed.

Lieut.-Gen. Sir Travers E. Clarke said the Army fully appreciated the value of the airmen and their craft. He was told that every man in the American army was to be capable of flying. He left it to the judgment of each individual to decide when that really came about, as to which branch of the American forces those men would belong.

Air Chief Marshal Sir Hugh M. Trenchard also replied.

Lieut.-Col. J. T. C. Moore-Brabazon, M.O., proposed "The Chairman," to which the Duke of Atholl briefly replied.

Among those present were:—The Earl of Caledon; Mr.

C. R. Fairey (Chairman of the Society of British Aircraft Constructors); Lieut.-Col. A. Ogilvie; Mr. Roger W. Wallace, K.C. (past-Chairman of the Royal Aero Club); Lieut.-Col. J. T. C. Moore-Brabazon, M.P. (Chairman of the Royal Aero Club) and Mrs. Moore-Brabazon; Brig.-Gen. Sir Capel Holden (past Chairman of the Royal Aero Club); Lady Weir; Lieut.-Col. F. K. McClean (Vice-chairman of the Royal Aero Club) and Mrs. McClean; Brig.-Gen. P. R. C. Groves; Rear-Admiral Sir Godfrey M. Paine; Lieut.-Col. M. O'Gorman, C.B. (Chairman of the Royal Aeronautical Society); Lieut.-Col. L. F. Blandy; Maj.-Gen. Sir W. S. Brancker (Director of Civil Aviation); Admiral the Hon. Sir E. Fremantle; Commander Kenworthy, M.P., and Mrs. Kenworthy; Sir John Leigh, M.P.; Lady Llangattock; Mr. and Mrs. S. Spooner; Mr. A. Lyle-Samuel, M.P.; Lieut.-Col. C. L'Estrange Malone, M.P.; Mr. F. Handley Page; Mr. and Mrs. C. G. Grey;

Commander J. Bird; Commander Burney; Dr. Quintin Chalmers; Admiral Mark Kerr; Sir David H. Kyd; Sir James Percy; Sir John and the Hon. Lady Shelley-Rolls; Mr. T. O. M. Sopwith and the Hon. Mrs. Sopwith; Mr. H. T. Vane; Brig.-Gen. J. G. Weir; Sir Henry White-Smith; Mr. C. V. Allen (Secretary, Society of British Aircraft Constructors); Lieut.-Col. C. Crookshank; Lieut.-Col. J. A. Cunningham; Lieut.-Col. and Mrs. Darby; Commander and Mrs. Davies; Commander E. B. Gardyne; Commander H. D. Grant; Lieut.-Col. Spenser Grey; Messrs. F. S. Bennett, R. Blackburn, G. Bradshaw, John Cates, E. C. Gordon England, V. Ker Seymer, H. Leitner, F. May, Harry J. Preston, J. D. Siddeley, G. Holt Thomas, J. E. Withers; Lieut.-Col. W. L. Marsh (Secretary, Royal Aeronautical Society); Major C. C. Turner; and Mr. H. E. Perrin (Secretary, Royal Aero Club).

THE AERIAL DERBY, 1922

THIS popular International "Annual" organised by the Royal Aero Club, and held under the Competition Rules of the Club and the Regulations of the F.A.I., takes place, as already announced, at Waddon Aerodrome, Croydon, on Monday, August 7. Prizes presented by the Royal Aero Club are as follows:—

Fastest Time (Winner of the Aerial Derby), Trophy and £300.

Handicap: First Prize, Trophy and £150; Second Prize, £75; Third Prize, £50.

The Regulations specify:—

Qualification of Competitors.—The Competition is open to persons of any nationality holding a licence issued by any Aero Club affiliated with the Fédération Aéronautique Internationale.

Organisation.—The Competition shall be conducted by the

Royal Aero Club under the Competition Rules of the Royal Aero Club and the Regulations of the Fédération Aéronautique Internationale.

Entries.—The Entry Fee is £10. Entries close on Wednesday, July 26, 1922, at noon. Late entries will be received up to 12 noon on Monday, July 31, 1922. Late Entry Fee £15.

Course.—The Course is approximately 200 miles, and will consist of a double circuit of London, starting from Waddon Aerodrome, Croydon, with the following turning points:—West Thurrock, Epping, Hertford, Brooklands Aerodrome, Weybridge.

Air Navigation Regulations.—Competitors must comply with the Air Navigation Regulations in force.

For any further information application should be made to the Royal Aero Club.

THE LONDON-CONTINENTAL SERVICES FLIGHTS BETWEEN JUNE 25 AND JULY 1, INCLUSIVE

Route†	No. of flights*	No. of passengers	No. of flights carrying		No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
			Mails	Goods				
Croydon-Paris ...	43	128	20	31	42	h. m. 2 46	D.H. 34 G-EBBS (2h. 3m.)	B. (6), D.H. 18 (2), D.H. 34 (2), G. (7), H.P. W.8B (3), Sp. (2), V. (1).
Paris-Croydon ...	44	114	10	33	41	2 54	D.H. 34 G-EBBS (2h. 0m.)	B. (6), D.H. 18 (2), D.H. 34 (2), G. (8), H.P. (1), H.P. W.8B (3), Sp. (3).
Croydon-Brussels ...	11	12	9	10	11	2 10	D.H. 34 G-EBBR (2h. 1m.)	D.H. 9 (1), D.H. 18 (2), D.H. 34 (1), W. (1).
Brussels-Croydon ...	11	9	—	7	11	4 5	D.H. 34 G-EBBR (2h. 41m.)	D.H. 9 (1), D.H. 18 (2), D.H. 34 (1), W. (1).
Croydon-Rotterdam-Amsterdam.	12	13	12	12	11	2 12	Fokker H-NABN (1h. 58m.)§	F. (6).
Amsterdam-Rotterdam-Croydon.	13	6	11	12	12	3 26	Fokker H-NABS (3h. 2m.)§	F. (8).
Totals for week ...	134	282	62	105	128			

* Not including "private" flights.

† Including certain diverted journeys.

‡ Including certain journeys when stops were made *en route*.

§ Rotterdam.

Av. = Avro. B = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. N. = Nieuport.
P. = Potez. R. = Rumpler. Sa. = Salmson. Sp. = Spad. V. = Vickers Vimy, Vulcan, etc. W. = Westland.

Incidental Flying.—During the week Maj. Foot and Capt. Stocken were testing machines for the Aircraft Disposal Co. at Croydon—the former a Martinsyde F4, and the latter the same machine, an Avro and a Bristol Fighter. On the 30th Stocken left for Brussels on the Bristol.

The Nation Saved!

"THE Army Council have decided to call on the London Territorial Associations to raise two anti-aircraft brigades to defend London in the event of an air attack."—*Daily Paper*.

This somewhat reminds us of the story of the R.F.C. mechanic who, in the early days of the War, when the station was being bombed, got out his revolver, and, in order to get

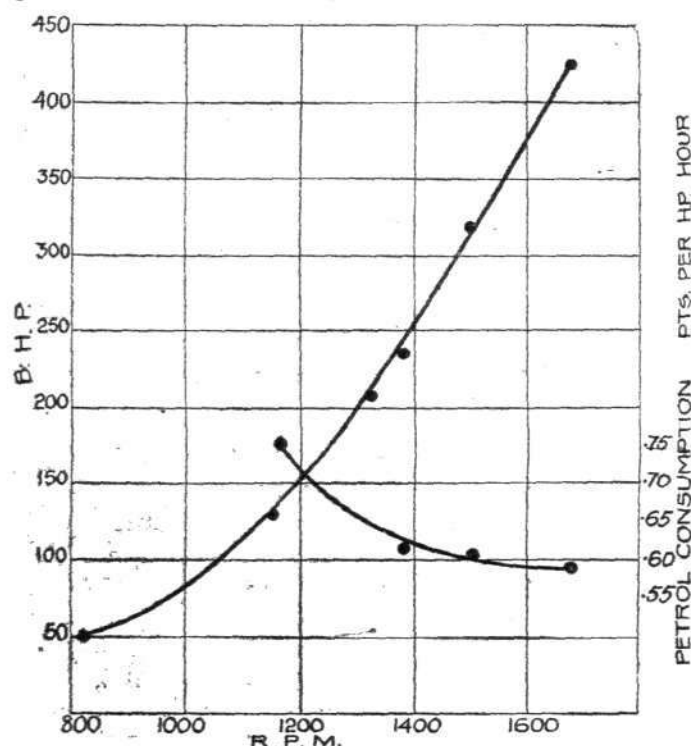
a little nearer to the enemy aeroplane, stood up on a petrol-tin while he blazed away with his six-shooter.

But, seriously, even this departure gives a little hope as an indication of a move in the right direction—provided the new units are equipped with something other than pop-guns. As a beginning of recognition by the Government of its responsibility, it is to be welcomed, although it does not avoid the need for an aerial defence of London.

THE BRISTOL "JUPITER" IN FRANCE

As no doubt many of our readers are aware, the Bristol "Jupiter" engine has scored another success, having just passed, with flying colours, the French 50-hrs. Type Test—and in so doing claims the distinction of being the first British engine to go through such a test in a foreign country. Whilst this is extremely gratifying as regards British progress in aviation, the gilt is taken off the gingerbread somewhat by the rumour that most, if not all, of the subsequent results of this achievement may be transferred to France and will not directly benefit the British industry. We refer to this matter elsewhere, and do not propose to dwell further upon it here, simply presenting the results of the test in question.

As regards the engine itself, we have previously described the "Jupiter" in *FLIGHT*, so that it should suffice to recall that it is a 9-cyl. air-cooled radial engine of 5½ ins. and 7½ ins. bore and stroke respectively, and weighs (minus fuel and oil) 729 lbs. The rated h.p. is 400, and the normal r.p.m. 1,575, the maximum permissible r.p.m. being 1,650.



Power and Consumption curves of the Bristol "Jupiter" taken at the French Type Test

Previous to the type test, engine No. 821 had been manufactured under conditions complying with the directions A.N.D. 1 of the Air Navigation Regulations, 1919. The total number of hours the engine had run previous to the type test was 28 hours 17 minutes, including 13 hours in England before being sent to France, and also the engine had done one 10-hour non-stop period in France, in order to test out the French test stand.

The engine was a standard production type, and the "Bristol" gas starter was used on every occasion for starting up the engine, and gave full satisfaction.

The power was measured on a torque reaction stand, the power being absorbed by a tractor airscrew, this propeller having been made by the Bristol Company and calibrated by the British Air Ministry.

Owing to the propeller being a left-hand tractor, the slip-

stream therefrom impinging on the cylinders caused a negative torque, and consequently the b.h.p. readings on the torque arm were appreciably reduced. In every instance allowance has been made for this negative torque, and the b.h.p. readings shown in the test are the actual power developed after making allowances for the negative torque and barometric pressure.

Previous to the endurance test a power curve and consumption curve were taken of the engine, which are shown in the accompanying diagram, and a slow-running test was made of 15 minutes' duration at 350 r.p.m.; the acceleration at the end of this test was good.

The endurance test was made in five periods of 10 hours' non-stop, 12 hours' stop being allowed between each test; 12 hours' duration was exceeded in one case owing to the fact that when the test was started up it was found that there was a stoppage in the main oil tank.

The five periods of 10 hours' non-stop were carried out without any replacements whatsoever, and without any adjustment beyond lubrication and examination of sparking plugs. This is the first time that this test has been carried out in 10-hour periods without any adjustments or replacements.

At the conclusion of the test the remarks on the official report were as follows:—

"The five tests of 10 hours were carried out without stop of any sort. Nothing to report. The engine behaved itself perfectly; there were no replacements of any sort in the course of the trials. It is regrettable that this test remains at 50 hours; this duration could have been doubled, which would have been a still better testimony for the engine."

At the conclusion of the test the engine was dismantled for examination. The engine was in excellent condition throughout, and the highest satisfaction was expressed at the general condition and wear of the parts.

Synopsis of 50-Hours Endurance Test

First 10 hours. Press. = 30 ins. Temp. = 18° C.

	Speed.	Torque (kgm.).	B.h.p.
First ½-hour ..	1610	158.25	358 (418)
9½ hours ..	1510	135	286 (330)
2 minutes ..	1610	162.75	365 (418)

Second 10 hours. Press. = 29.9 ins. Temp. = 20° C.

	Speed.	Torque (kgm.).	B.h.p.
First ½-hour ..	1585	151.5	338 (398)
9½ hours ..	1505	129.75	273 (325)
2 minutes ..	1620	165	373 (428)

Third 10 hours. Press. = 29.8 ins. Temp. = 17° C.

	Speed.	Torque (kgm.).	B.h.p.
First ½-hour ..	1600	151.5	345 (410)
9½ hours ..	1525	139.85	298.5 (342)
2 minutes ..	1610	162.75	365 (418)

Fourth 10 hours. Press. = 29.8 ins. Temp. = 17.5° C.

	Speed.	Torque (kgm.).	B.h.p.
First ½-hour ..	1615	148.5	335 (420)
9½ hours ..	1515	132.75	285 (325)
2 minutes ..	1610	159	357 (418)

Fifth 10 hours. Press. = 29.9 ins. Temp. = 17° C.

	Speed.	Torque (kgm.).	B.h.p.
First ½-hour ..	1610	153	344 (418)
9½ hours ..	1525	134	289 (342)
2 minutes ..	1610	162.75	365 (418)

10 hours.	Full Throttle.		Consumption.				Slow.	
	Petrol	Oil.	First ½-hour.		Petrol	Oil.	Petrol	Oil.
	(pts.).	(pts.).	Petrol	Oil.	Petrol	Oil.	(pts.).	(pts.).
	Total.	gal/hr.	Total.	h.p./hr.	gal/hr.	Total.	h.p./hr.	gal/hr.
1 ..	243	1.36	228	0.65	1.32	189	0.58	1.21
2 ..	249	1.36	226	0.672	1.32	191	0.7	1.21
3 ..	243	1.36	228	0.657	1.32	202	0.675	1.23
4 ..	229	1.36	226	0.678	1.32	198	0.708	1.23
5 ..	243	1.36	237	0.69	1.32	200	0.693	1.24

A DUTCH COMPETITION

THE Royal Dutch Aero Club has opened a competition, which has for its object the advancement of the safety of commercial aviation by reducing the risks encountered when landing in fog. It is open to competitors of all nationalities. The chief prize of 3,000 f. (3,000 guilders) will be awarded to the competitor sending in the best apparatus (instrument or set of instruments) with which, in an aeroplane flying in a thick fog, the height above the ground, or the surface of the water, can be measured.

The conditions are as follows:—

- (1) The indication must take place independent
 - (a) of any installation on the ground or on the water;
 - (b) of the atmospheric pressure.

- (2) The error of the indication may
 - (a) not exceed 1 metre on a height below 10 metres;
 - (b) not exceed 10 per cent. of the true height at an altitude between 10 and 300 metres.
- (3) The indication, as mentioned above, must take place in an aeroplane, of which the velocity has
 - (a) a horizontal component of 10 to 50 metres per second;
 - (b) a vertical component of 0 to 5 metres per second.

Entries close on March 15, 1923, and further particulars may be obtained from the Secretary, Technical Committee, Royal Dutch Aero Club, Heerengracht No. 13, The Hague, Holland.

STRUCTURAL STRENGTH OF AIRCRAFT

Requirements for Certificates of Airworthiness

WE have received from the Air Ministry the following announcement in respect to the granting of certificates of airworthiness:—

Early in 1920 a Sub-Committee of the Advisory Committee for Aeronautics reported upon the Load Factors that should be adopted as the basis upon which to determine the strength of civil aircraft, and the recommendations embodied in that report (R. & M. 673) were adopted by the Air Council. Experience having shown that alterations were desirable, the Load Factors Sub-Committee of the Aeronautical Research Committee was re-convened in 1921 with a view to the revision of the previous scheme in so far as it related to aircraft of the "Commercial" class. The Report of this Committee has now been received, and will shortly be published in full.

While considering that it will eventually be found possible to standardise a more logical scheme, the Committee recommend that in the meantime the existing schedule (R. & M. 673) for the commercial class of aircraft should be retained subject to certain revisions. The Air Council have adopted these recommendations, and propose to apply them forthwith in the case of new designs submitted for certificates of airworthiness.

The following summary of these requirements, to which the Air Council have added further requirements relating to the "general" and "racing" classes, is therefore issued for the information of those concerned.

New type aircraft submitted for Certificate of Airworthiness are divided into two classes as under:—

(1) *General Class*.—Aircraft granted a general class certificate are certified airworthy for general use, including exhibition flying and aerobatics.

(2) *Commercial Class*.—Aircraft granted a "commercial class" certificate are certified airworthy for "straight flying" only, and must not be looped, rolled or put to any aerobatic manoeuvre involving sudden change of attitude. The standard of strength is lower than that for the general class.

In Tables I and II the load factors required in these two classes are given. These are graduated according to the total weight of the aircraft. A brief description of the cases to be considered is given below.

Case (a 1). Centre of Pressure Forward, Engine Off.—The aircraft is assumed to be in a condition of equilibrium at an attitude corresponding to steady horizontal flight, with the centre of pressure in its most forward position. The engine is to be assumed cut off, and the drag of the airscrew is to be included.

Case (a 2). Centre of Pressure Forward, Engine On.—This condition is identical with (a 1) except that the engine is assumed to be running. The airscrew drag is thus replaced by airscrew thrust; this and the torque are given by the formulæ:—

$$\text{Thrust} = \frac{2 \times \eta \times 550 \text{ h.p.}}{V \sqrt{\frac{N}{2}}} \text{ lbs.}$$

$$\text{Torque} = \frac{33,000 \times \text{h.p.}}{\eta \times \text{r.p.m.}} \text{ ft. lbs.}$$

where V is velocity of normal flight with centre of pressure in its most forward position in feet per second.

N is the load factor.

H.P. is brake-horse-power of the engine.

η is the airscrew efficiency, which in the absence of special data may be taken as 0.8.

The thrust and torque given by these formulæ are twice the actual values.

Case (b). Centre of Pressure Back.—The aircraft is assumed to be flying at maximum horizontal speed at ground level. The load factor in this case applies only to the wings.

Case (c). Limiting Nose Dive.—The aircraft is assumed to be diving at limiting velocity. In calculating this velocity the airscrew drag may be included.

The above cases cover the wings and tail plane and the fuselage for certain flight loads.

Case (d). Side Load on Fin and Rudder.—For this case a lift coefficient is given which when the stalling speed of the aircraft is known determines the load which the fin, rudder and fuselage must withstand. This load is given by:—

$$\text{Side load} = k_1 \rho S (1-4 V_s)^2$$

where k_1 is lift coefficient (from table),

S fin and rudder area in sq. ft.,

V_s stalling speed of aircraft in ft./sec.,

ρ air density in slugs per cubic ft.

Under this load the load factor throughout should be 2.

Case (e). Landing.—For this case the aircraft must be assumed to land in the two following ways:—

- (i) On an even keel with the chord of the main planes horizontal.
- (ii) On an even keel so that the tail skid and under-carriage touch the ground simultaneously.

The vertical travel of the under-carriage should be such that the total energy absorbed is not less than $\frac{1}{2} W V^2$ where V is a velocity given by:—

$$V = 3 + .1 V_s$$

V_s is the stalling speed in ft./sec.

W = is weight of aircraft in lbs.

TABLE I.—Schedule of Load Factors (General Class)

Case.	Total Weight of Aircraft in lbs.			
	Up to 2,500 lbs.	2,500 to 5,000 lbs.	5,000 to 10,000 lbs.	Above 10,000 lbs.
(a 1.) Load factor with C.P. forward—engine off	7.5	7.5-7	7-6	6
(a 2.) As (a 1)—engine on..	7.5	7.5-7*	7-6*	6
(b.) Load factor with C.P. in most backward position in horizontal flight	5.5	5.5-5*	5-4.5*	4.5
(c.) Load factor in nose dive at terminal velocity	1.5	1.5	1.5	1.5
(d.) Specified lift coefficient for fin and rudder; under this loading the load factor should be 2	0.5	0.5	0.5	0.5
(e.) Load factor on under-carriage when subjected to the maximum forces of compression	1.15	1.15	1.15	1.15

* The decrease in load factor from the large value is directly proportional to the increase in the weight of the craft.

TABLE II.—Schedule of Load Factors (Commercial Class).

	Total weight of Aircraft.				
	Up to 2,500 lbs.	2,500-5,000 lbs.	5,000-10,000 lbs.	10,000-30,000 lbs.	Above 30,000 lbs.
(a 1.) Load factor with C.P. in its most forward position, engine off	5.5	5.5-5*	5-4*	4	4
(a 2.) Same as (a 1), but with engine on	5.5	5.5-5*	5-4*	4	4
(b.) Load factor with C.P. in the position corresponding to maximum horizontal speed at ground level	4	4-3.25*	3.25-3*	3	
(c.) Load factor in vertical nose dive at terminal velocity	1.25	1.25	1.25	1.25	
(d.) Specified lift coefficient for fins and rudders. (Under this loading the factor of safety of the fuselage should be 2)	0.5	0.5	0.5	0.5	
(e.) Load factor on under-carriages when subjected to the maximum forces of compression	1.15	1.15	1.15	1.15	

* The decrease in load factor from the larger value is directly proportional to the increase in the weight of the craft.

The under-carriage, under the maximum load brought about by the absorption of this amount of energy, must have a load factor not less than 1.15. The remainder of the structure under the same load must have a load factor of at least 1.25.

With the aircraft resting on the ground the under-carriage must in no case have a load factor less than 4, nor the rest of the structure a load factor less than 4.5.

To ensure adequate strength against side load, the under-carriage must be sufficiently strong to withstand a side load equal to the weight of the aircraft applied at the axle.

In cases (a 1), (a 2) and (b) above the load factor on the wings, with any one flying wire or pair of duplicate flying wires removed, must not be less than one-half that required in the normal case.

The above instructions, together with Table I, embody the recommendations of the Load Factor Sub-Committee for Commercial Heavier-than-Air Craft.

Racing Aircraft.—Aircraft which require a Certificate of

Airworthiness in order to compete in public air races will be granted a special form of certificate, the strength requirements being as under:—

Load factor throughout structure with centre of pressure in the most forward position in horizontal flight	4
Load factor on wings with centre of pressure in the furthest back position in horizontal flight	3
Load factor in terminal nose dive	1
Load factor on fin and rudder and fuselage under side load of 30 lbs. per sq. ft. on fin and rudder ..	1

Methods of Calculation.—The above factors apply to aircraft with two or more main planes and of normal construction. The factors are to be determined by the official methods published by the Directorate of Research. In cases of novel or unusual construction where the usual assumptions and methods of calculation cannot be directly employed, reference should be made to the Directorate of Research for a ruling as to strength requirements and methods of calculation.

NOTICES TO AIRMEN

Aerodrome Control : Croydon and Lympe

It is notified:—

1. Taking off—Croydon.

(a) All pilots in charge of aircraft about to leave the aerodrome will obtain their order of priority in taking-off from the Civil Aviation Traffic Officer on duty for this purpose.

(b) Pilots ready to take-off will await a signal from the C.A.T.O. to do so. Signals will be given to pilots in the order of priority allotted, and on receiving the signal pilots will take-off without undue delay.

(c) In no case, however, will pilots take-off when other aircraft are about to land.

2. Landing—Croydon and Lympe.

All pilots on arriving at the aerodrome will make at least one complete left-handed circuit of the aerodrome before landing, and will continue this circuit until in their opinion landing can be effected without risk of collision.

3. Landing and Taking-off in Calm Weather—Croydon.

(a) In calm weather at Croydon aerodrome all machines will take-off and land on some bearing between North-West and West.

(b) Calm weather will be indicated by a white ring on the aerodrome in front of the Traffic Office.

4. All pilots in charge of aircraft using the aerodromes at Croydon and Lympe will conform to these regulations.

(No. 62 of 1922.)

London-Paris : Official Air Route Directions

1. With reference to the Convention for the Regulation of Aerial Navigation, October 13, 1919, Annex D, Section 5, para. 31, which reads as follows:—

"In following an officially recognised air route every aircraft, when it is safe and practicable, shall keep to the right side of such route";

an agreement has been reached between the British and French Governments whereby certain portions of the London to Paris air route have been defined as the officially recognised route, namely:—

London to Paris

Croydon to Oxted.—No official route.

Oxted to Ashford.—The main railway line connecting these places.

Ashford to Etaples.—No official route.

Etaples to Abbeville.—Main railway line connecting these places.

Abbeville to Ecouen.—The main road running through Abbeville, Poix, Grandvilliers, Beauvais to Paris.

Ecouen to Le Bourget.—No official route.

2. The following supplementary rules of the air have been agreed upon by the British, French and Belgian Governments:—

Where an official route has been defined, every aircraft shall:—

(a) Keep at least 100 metres from the route when following such route.

(b) Should the pilot deem it necessary to cross from the right side to the left side of the route, he must cross the route at right angles and as high as possible. Flight should not be resumed on the left of the route in a direction parallel to the route until the aircraft is at least 10 kilometres distant from it.

(c) Similarly, should the pilot wish to cross from the left to the right side, the direction of flight must be at right angles to the route and as high as possible.

(d) Where an aircraft is flying beneath low clouds, it shall be flown, as far as possible, below the cloud base in order to see and be seen.

(No. 64 of 1922.)

Wireless Telegraphy Stations in Operation in Connection with Civil Air Routes : Amendments

It is hereby notified:—

(1) With effect from July 1, the Synoptic Reports and General Inferences issued on 1,400 metres C.W. by Air Ministry daily at 0600, 0800, 1400 and 1900 (G.M.T.); and 0915 and 2000 (G.M.T.) respectively will be transmitted on 4,100 metres C.W. The Synoptic at 0200 will continue on 1,400 metres as hitherto. The 0830 report will cease.

(2) In cases where breakdown of the main set, or other delay in commencing transmission on 4,100 metres is occasioned, should transmission not have been commenced at the expiration of ten minutes, the message will be issued on 1,400 metres commencing at ten minutes after the routine hour.

(3) Previous Notices affected:—

The table in para. 1, Notice to Airmen, No. 43 of 1922, is amended accordingly. (No. 65 of 1922.)

ROYAL AERONAUTICAL SOCIETY NOTICES



Examination.—The first Associate Fellowship examination of the Royal Aeronautical Society, in accordance with the new regulations, will be held on September 25 (Part I) and September 26 (Part II), in the Library at 7, Albemarle Street, London, W.1. Entries, accompanied by the prescribed examination fee, should reach the Secretary at that address not later than Monday, August 28.

R. 38 Memorial Research Fund.—It has been decided to utilise the Royal Aeronautical Society's R.38 Memorial Research Fund as follows:—

(a) To the placing of a memorial tablet in the Society's offices.

(b) To the awarding of an annual prize of 25 guineas for the best technical paper on aeronautics, preference being given to those dealing with an airship subject. This prize to be open to international competition.

(c) To the selection and collation of information on the development of design of airships to the present stage.

The balance of the income being allowed to accumulate for the present.

Usborne Memorial Fund.—The interest of the Usborne Memorial Fund is to be devoted to the award of a prize in every alternate year (unless the amount be such as to allow of an annual prize to the value of £10) for a historical paper on any aspect of aeronautics. This prize will also be open to international competition. Detailed regulations for these two prizes are being drawn up.

W. LOCKWOOD MARSH,
Secretary

LONDON TERMINAL AERODROME

Monday evening, July 3, 1922

HANDLEY PAGE TRANSPORT continue to carry the bulk of the passenger traffic, and are getting something like full loads for their new 12-seater "W.8B's." Passenger traffic, as a whole, has improved slightly during the week. Even the K.L.M., whose traffic is so largely goods, have had a considerable increase in their passengers. The Instone Air Line have now a regular morning newspaper service to Brussels, but, owing to the shortage of machines, they are unable to take all the traffic that would be forthcoming for this service. As it is, they have to limit their load to the capacity of one of their Westland limousines, with which they are carrying out this service.

There have been one or two sensational "take-offs" during the week, emphasising the need for strong nerves in those whose business keeps them regularly on the aerodrome, and also lending point to the general opinion that "someone is going to hit the fence" sooner or later. The Vickers "Vimy" which has been built for the Grands Express, and has had her two Napier "Lion" engines replaced by 400 h.p. Lorraine-Dietrich engines, was taking off into a south-west wind, and appeared to only just clear the Customs House, and to narrowly miss the giant Handley Page sign. This same machine went off to Paris on Saturday, piloted by Mr. Cockerell, and this time took off quite well.

A Rather Too Exciting Moment

THE second sensational take-off occurred on Saturday, when a Breguet was taking off in the same direction. M. Didier and several others were standing on the tarmac, when it suddenly dawned on them that the machine was not rising and was hurtling along the ground straight towards them. There was a sudden rush as they scattered in all directions, while a little group of people by the weather-hut endeavoured to get into the next county in quick time. The machine, however, rose just as it reached the tarmac, and managed to scrape over the top of the weather-hut by inches. Had the pilot been a few yards to the right, he would have caught the wind indicator mast, as he was well below the vane.

The K.L.M. continue to carry big loads of goods to and from Holland. On one of the early morning machines, there was a load of 900 lbs. weight, which Mr. Hofstra took off the ground in the "F.3" with ease. The parcel post by aeroplane to Holland is, apparently, becoming popular. One day's consignment, recently, weighed as much as 130 lbs. This is a very encouraging sign, as, with the facilities of the Post Office for collecting and delivering from all parts of the country, there is no reason why this traffic should not become a mainstay for all the airways. It is free of a great drawback that attends ordinary goods traffic—this drawback being that goods require so much expenditure in motor-vans for collection and delivery that it costs as much, if not more, to collect goods by motor transport as the entire charge for conveying them to Paris by air, leaving nothing for the flying portion.

The Instone Air Line have, apparently, over-staffed themselves with pilots, and are now having to reduce their numbers. Messrs. Bradley and Keys are, I understand,

leaving the firm, and are open to engagement as pilots either at home or abroad. Mr. Keys flew over to Stag Lane in one of the Surrey Flying Service's Avros, in order to take a "D.H.9" belonging to the "taxi" service of the De Havilland Aircraft Co., to Dublin. As it happened, however, when he arrived at Stag Lane, it was decided that, as two of the De Havilland taxiplanes were already held up in Dublin by the authorities, no more should be sent; and so Mr. Keys took a machine out for photographic work instead. He is delighted with the courtesy of this firm, who flew him back to Croydon in a "D.H.9" when he had completed his day's work for them.

An Important Early-Morning Conference

DURING the week, Major-General Sir W. S. Brancker held another of his early-morning meetings at the air-station. Brigadier-General Festing accompanied him, and the meeting was attended by representatives of the various British air-transport companies and pilots. General Brancker asked for suggestions as to the requirements of the firms in the way of new machines—such as what performance they required, and what load they wished the machines to carry.

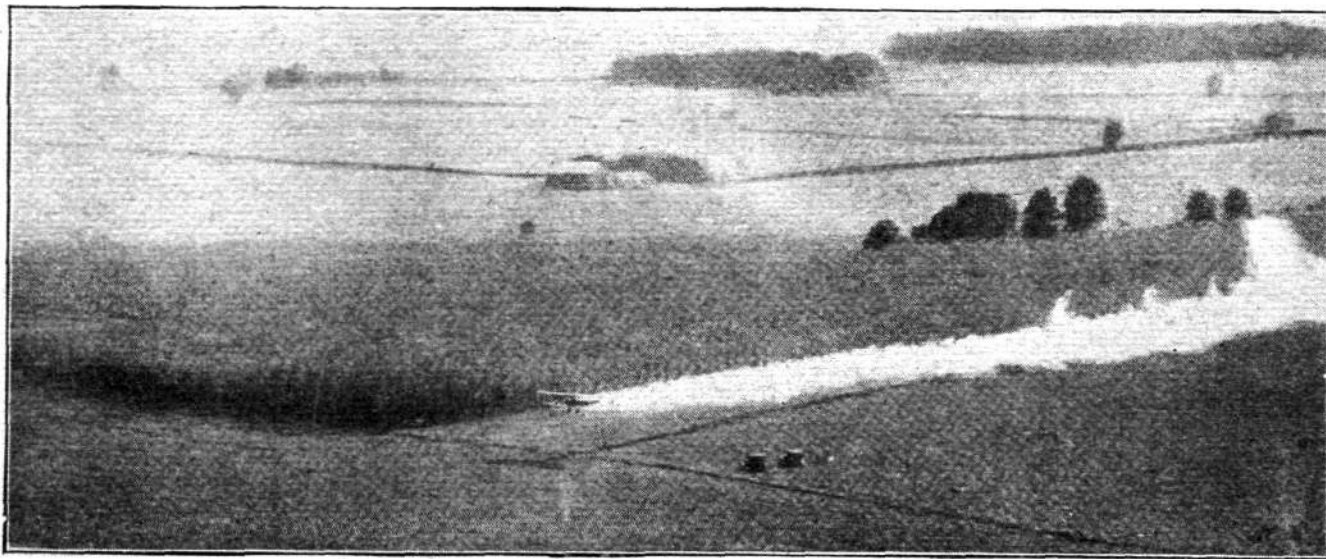
It is evident that he intends to ask designers to submit designs for machines for next year's work that will embody the experience so far gained in air transport. In addition, the form in which weather reports should be transmitted to pilots while in flight was discussed; also new regulations with regard to the tests pilots should undergo in order to obtain their licences. I understand that it was proposed that pilots should make a stipulated number of landings, with machines empty, and also with full load, and that an examination in engines should also be part of their tests. Everybody at the air-station is impressed by General Brancker's keenness, and by his evident desire to do all in his power to further commercial aviation, and, at the same time, to safeguard passengers.

The British Success at Brussels

I HEAR that as a result of the competition for commercial aeroplanes held at Brussels on Sunday, June 25, and won by the Handley Page "W.8.b.," this firm have obtained an order from the Belgian Government for six of these machines. Up to the present, however, I have been unable to obtain definite confirmation of this.

The "S.E.5's" which the Aircraft Disposal Co. sent to these competitions have been flown back to Croydon during the week. Mr. Courtney, while flying one of these machines, experienced engine trouble while still five miles out over the Channel, and had the utmost difficulty in reaching the English coast. He succeeded, however, in arriving over the Dover aerodrome, only to discover that it was covered with sheep and hurdles; so he was compelled to land on the cliffs, pulling up within 20 yds. of the edge.

During bad weather in the Channel, Mr. Robertson, flying the Daimler Airways "D.H.34" attempted to get across from the English side, when, suddenly, the masts of a ship loomed up out of the clouds. He found that he was actually below the top of the masts, which were in the clouds, and wisely decided to turn back, alighting safely at Lympne.



AEROPLANE v. INSECTS : We referred recently to some experiments carried out at Ohio in which an aeroplane flew over a plantation of Catulpa trees, spraying them with arsenate of lead, with a view to destroying a plague of caterpillars. Above will be seen a Curtiss biplane, piloted by Lieut. Macready, discharging its "poison gas," which successfully accounted for practically every caterpillar.

IN PARLIAMENT

Air Power

MR. LAMBERT, on June 26, asked the Prime Minister whether, as our Air Force is dangerously deficient as a protection against invasion, and the fighting services are costing this year £167,000,000 as against £86,000,000 pre-War, he will appoint a Commission to ascertain how most efficiently the public money can be spent for defence, having regard to modern aircraft developments?

The Prime Minister: No, Sir. The matters referred to are already under the consideration of the Committee of Imperial Defence.

Mr. Lambert: Has any definite action been taken to avoid a great waste of the taxpayers' money?

The Prime Minister: The matter is being carefully considered by the experts who advise the Government, and they are also considering the machinery for the purpose.

Mr. Lambert: In view of the fact that the Committee of Defence is a very hard-worked body, will the right hon. gentleman consider the advisability of appointing a separate Commission?

The Prime Minister: I think it must be the Committee of Imperial Defence; a separate Committee of that body.

Indian Mails

LIEUT.-COMMANDER KENWORTHY, on June 27, asked the Postmaster-General how long the mails take to reach India from this country; if he is aware of the great importance to merchants in Great Britain and India of a quick mail service; what steps are being taken to expedite the Indian mail service; and whether the possibilities of quick overland or aerial transport have been considered, and with what result?

Mr. Pease: The Indian mail is due at Bombay in 14½ days after leaving London. Occasionally it arrives rather later, as the Peninsular and Oriental Steam Navigation Company have not yet been able to replace fully their war losses and to provide a fleet of uniform speed for the service. I am aware of the great importance to commercial interests of a quick mail service to India, and advantage is taken of every opportunity of improving the service. I do not see any prospect of any material acceleration in overland transit. The possibilities of air transport in connection with the Imperial mail services generally are being explored by the Civil Aviation Advisory Board.

Lieut.-Commander Kenworthy: Is the right hon. gentleman's Department in constant consultation with the Middle East Department with a view to utilising aircraft, which now fly continuously in that area, with a view to quickening up the mails?

Mr. Pease: This question is being considered by the Civil Aviation Advisory Board at present.

Lieut.-Commander Kenworthy: Is the Post Office represented on that?

Mr. Pease: Yes.

Royal Air Force (Naval Wing)

VISCOUNT CURZON asked the Secretary of State for Air whether he can make any statement or give any figures to show the work actually carried out by the Naval Wing of the Royal Air Force during the past 12 months?

Capt. Guest: Beyond stating that I am satisfied with the progress that has been made in the development of aircraft co-operation with the Navy during the past 12 months, I do not consider that it would be in the public interest to make any detailed statement of the work performed or to give any figures of the flights carried out.

Viscount Curzon: Is the right hon. gentleman aware that during the discussion on the Air Force Estimates he failed to give any item of information relating to the work of the Naval Air Service, and a wide impression exists that the power provided by the Air Ministry is not adequate for the work which that service has to do?

Capt. Guest: The wide impression is largely created by my noble friend. Next year I will do my best to make up for it.

Minister of Air

MR. L. MALONE asked the Prime Minister whether, in view of the fact that it is increasingly possible to substitute air forces for naval or military forces and thereby effect considerable economies, he will reconsider his decision and place the Air Minister on a footing in the Cabinet where air propositions will not be overruled by naval and military arguments put forward without a proper consideration of the air side of the question?

Mr. Lloyd George: I have nothing to add to my answer of June 22. I do not accept the allegation in the last part of the hon. member's question.

Foreign Passenger Aircraft and a Second Pilot

SIR H. BRITAIN asked the Secretary of State for Air whether, seeing that at least 60 foreign-owned aeroplanes, carrying but a single pilot, are expected to continue trading between their respective countries and Great Britain, he can give instructions to advise the British travelling public as to which concerns are taking the precaution of carrying an additional pilot on each of their planes?

Capt. Guest: The desirability of passenger aircraft being provided with a second pilot is appreciated, but it is not a compulsory condition for international navigation under the Air Navigation Convention of 1919, and I think that the British public must use their own judgment in selecting the air line by which they travel. I may add that nearly all the French aeroplanes flying on the London-Paris service have accommodation for a second pilot, although not fitted for dual control (The Dutch machines flying on the England-Holland route have accommodation for one pilot only.)

Night Flying

SIR H. BRITAIN asked the Secretary of State for Air whether he is able to inform the House as to the results achieved in the recent experiments in night flying carried out between this country and France?

Capt. Guest: The flight of the British aeroplane from London to Paris by night was quite successful. It established the fact that the lighting arrangements, both in this country and in France, are satisfactory, except that wind indicating lights have not yet been established on the emergency landing-places; steps are being taken to remedy this defect so far as the British portion of the route is concerned. It is understood that the French flight from Paris to London and back was equally successful.

Capital Ships and Air Attack Experiments

LIEUT.-COMMANDER KENWORTHY, on June 28, asked the Parliamentary Secretary to the Admiralty whether it is proposed to carry out experiments with the various methods of attack from the air against any of the capital ships due to be scrapped under the terms of the Washington agreement?

Commander Eyres-Monsell: The answer is in the affirmative.

Lieut.-Commander Kenworthy: Can we be informed of some details? How many ships are going to be experimented upon, and when will it take place?

Commander Eyres-Monsell: The experiments are being carried out on H.M.S. "Superb." These will be preceded by those on the monitor "Gordon," which does not come under the provisions of the Washington Treaty.

R.A.F. Aeroplanes

MR. ALFRED T. DAVIES, on June 29, asked the Secretary of State for Air whether his attention has been directed to the fact that at the recent display of the Royal Air Force at Hendon the aeroplanes used were each, approximately, four years old; whether similar machines are being used in Iraq, Somaliland, and India on active service; whether any squadrons of the Royal Air Force are equipped with up-to-date aeroplanes; what number of new and improved aeroplanes have been supplied to squadrons of the Royal Air Force this year; and what is the cost of such supply?

Captain Guest: In answer to the first question, it is true that the aeroplanes used at Hendon, with the exception of the experimental machines, were not less than four years old, but they were all thoroughly sound and serviceable, many of them recently re-conditioned, and all capable of satisfactory performance. As regards the second and third questions, the same general remark applies, but some of the squadrons abroad have been partly re-armed with new aeroplanes, and the four squadrons working with the Navy are being completely re-armed. The answer to the fourth and fifth questions is, that 10 aeroplanes of new type have been issued to squadrons since 1st April, 1922, and that the approximate cost was £106,000.

Rear-Admiral Sueter asked the Secretary of State for Air if he can give the date of construction of the majority of machines now in use for air work in Iraq; whether these machines are satisfactory and their carrying capacity adequate when the proper load of petrol is carried for the desert journey; and at what date will more modern machines, such as those being now used on the London-Paris route, be sent out to replace the older types?

Captain Guest: With the exception of the Vickers type, all the aeroplanes used on the cross-desert route are either of 1918 or 1919 build; the Vickers, of 1921 build, with a few of 1919 and 1920. These aeroplanes are all serviceable, and it would be expensive and quite unnecessary to replace them at present. In the interests of economy, it is urgently necessary to use up existing serviceable war stocks of aeroplanes before ordering new ones. The aeroplanes are not specially built for the cross-desert route, and it is neither necessary nor practicable to build a new type of aeroplane for every kind of work which the Air Force has to do. The civil aeroplanes used on the London-Paris route are of a variety of types, and would not be suitable for the Royal Air Force work without extensive modifications. I can assure my hon. and gallant friend that the question of the re-equipment of the Royal Air Force with new types of aeroplanes is fully recognised as one of the greatest importance, and is being given constant careful consideration by my expert advisers.

Captain Viscount Curzon: Is it not a fact that many firms engaged in the manufacture of aircraft and aircraft engines are being compelled to go out of business altogether through lack of orders?

Captain Guest: I regret to say there is a good deal of truth in the noble lord's supplementary.

The Burney Airship Scheme

MR. L'ESTRANGE MALONE asked the Secretary of State for Air if his Department has approved the Burney airship scheme; and, if any reservations were made, what were those reservations?

Captain Guest: The Burney airship scheme has been referred to the Committee of Imperial Defence for consideration, and I do not think that it would be proper for me to make any further statement on the matter at the present time.

Mr. Malone asked the Prime Minister whether the Burney airship scheme has yet been considered by the Committee of Imperial Defence; and when a decision may be expected?

Mr. Lloyd George: The Burney airship scheme is being considered by the Committee of Imperial Defence, and it is hoped that a decision will be taken at an early date.

Civil Aviation

REAR-ADMIRAL SUETER asked the Secretary of State for Air, in view of the allegations now being made that civil aviation in this country has almost entirely disappeared, and that the aircraft industry is lacking in orders to keep it in a normal healthy condition, whether he will state what steps he proposes to take to remedy this state of affairs?

Captain Guest: It would be impracticable to deal adequately with the state of civil aviation in this country by way of question and answer, and I can only repeat the suggestion made in my reply on June 19, that, if the House desires, an opportunity to discuss the question can be taken on the Civil Aviation Vote, which is still on the Paper.

Captain Wedgwood Benn: Will the right hon. gentleman speak to the Leader of the House, with a view to getting an additional Supply day for this important purpose?

Captain Guest: I suggest to the hon. and gallant gentleman the usual channels.

Captain W. Benn: I am asking whether the right hon. gentleman will support those who wish for an additional day. He is aware that the 20 days are fully occupied with controversial and political topics.

Lieut.-Col. Sir F. Hall: Is it not advisable, seeing that a Committee is now sitting on civil aviation, that the matter should be left in abeyance until their first report comes forward, and is it not a fact that that report is expected very shortly?

Aerial Defence

LIEUT.-COMMANDER KENWORTHY asked the Prime Minister whether he will give the names of the persons forming the Committee to consider the problem of aerial defence; how long the Committee has been in being; how many sittings have been held; who is the chairman, and what means are taken to consult the War Office, Admiralty and Air Ministry, and to keep them informed of the conclusions arrived at?

The Prime Minister: It is not considered desirable to give the information asked for as to the composition and proceedings of committees conducting secret enquiries. The Admiralty, War Office and Air Ministry are represented on the Committee, and its conclusions will be communicated to the Departments concerned in due course.

Lieut.-Commander Kenworthy: Can my right hon. friend answer the second part of the question as to how long this Committee has been in being? Is he aware that there is a great deal of public anxiety that money is being wasted on obsolete weapons of war and not on the air service?

The Prime Minister: I know there is a feeling of anxiety, and quite reasonably so. I also know that this matter is being pressed forward by the various Departments concerned, but there is some preparation required before they can investigate the matter.

Lieut.-Commander Kenworthy: How long has the Committee been functioning?

THE ROYAL AIR FORCE

London Gazette, June 20, 1922

Medical Service

The following are granted short service commns. in ranks stated, with effect from, and with seny. of, the dates indicated:—

Flight Lieuts.—A. J. Brown, D.S.O.; June 1. P. Rutherford, O.B.E.; June 8.

Flying Offr. (Hon. Flight Lieut.)—H. W. Street, M.B.; June 6.

H. C. Perkins is granted a tempy. commn. as a Flight Lieut., with effect from, and with seny. of, June 6.

Memoranda

The following are granted tempy. commn in ranks stated for service with No. 1 Works Co.; June 1:—Sgdn. Ldr. M. C. Rousseau, Flying Offr. (Hon. Flight Lieut.) G. M. Cox, Pilot Offr. W. J. Root.

London Gazette, June 27, 1922.

General Duties Branch

The following are granted short service commns. as Pilot Officers on probation with effect from, and with seny. of, June 10:—R. Collins, B. R. C. Coope, C. Denison, F. W. M. Doner, R. Fisher, M. C. W. C. Flint, M.C., D. M. Morphy, L. G. Pinnell, G. F. Reeves, A. C. W. Richards, A. Thompson, M. B. F. Watson.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

Air Commodore L. E. O. Charlton, C.B., C.M.G., D.S.O., from British Embassy, Washington, to R.A.F. Depôt (Inland Area) (Supernumerary). 1.5.22. Group Captain J. G. Hearson, C.B., D.S.O., from British Delegation (Air Section) Paris, to R.A.F. Depôt (Inland Area) (Supernumerary). 1.6.22. Wing Commander R. J. F. Barton, O.B.E., from No. 28 Squadron (India), to R.A.F. Depôt (Inland Area) (Supernumerary). 10.5.22.

Squadron Leaders E. Huntley, M.B., B.S., to No. 1 School of Technical Training (Boys) (Halton), on appointment to Temporary Commission. 22.5.22. W. Sowrey, A.F.C., from No. 84 Squadron (Iraq) to R.A.F. Depôt (Inland Area) (Supernumerary). 14.4.22. F. A. Baldwin, from Iraq Group Headquarters (Iraq Group) to Aircraft Park Iraq (Iraq Group). 14.3.22. J. W. Cruikshank, O.B.E., from No. 4 Flying Training School (Middle East), to Headquarters, R.A.F. Iraq (Supernumerary), to command Armoured Car Company (on formation). 16.5.22. R. Leckie, D.S.O., D.S.C., D.F.C., from Canadian Air Board to No. 1 School of Technical Training (Boys) (Halton), on ceasing to be seconded to the Canadian Air Board. To join 8.6.22. 27.5.22. W. Tyrrell, D.S.O., M.C., M.B., from R.A.F. Depôt (Inland Area), to Research Laboratory and Medical Officers' School of Instruction (Inland Area) (Supernumerary). 1.6.22. R. A. G. Elliott, B.M., B.A., from R.A.F. Depôt (Inland Area), to Central Medical Board (Inland Area) (Supernumerary). 1.6.22.

Flight Lieutenants R. C. L. Holme, M.C., from No. 70 Squadron (Iraq Group), to No. 1 Squadron (Iraq Group). 25.3.22. L. J. Maclean, M.C., from Central Air Communication Section (Iraq) to Headquarters, R.A.F. (Iraq). 1.4.22. H. Leadham, from Aircraft Park, Iraq (Middle East Area), to Iraq Group Headquarters (Middle East Area). 22.12.21. G. M. Moore, M.C., from Central Air Communication Section (Iraq), to Headquarters R.A.F. (Iraq). 1.4.22. A. W. Clemson, O.B.E., D.S.C., from R.A.F. Depôt (Inland Area), to Headquarters, R.A.F. (Iraq). 2.6.22. H. W. Evens, from Seaplane Training School (Coastal Area), to Headquarters, R.A.F. Iraq (Supernumerary). 2.6.22. B. C. Tooke, from Seaplane Training School (Coastal Area), to Headquarters,

The following Lieuts., Army, relinquish their tempy. commns. on return to Army duty:—Flying Officer W. R. Oulton, A.F.C. (Cheshire Regt.); June 15. Flying Officer A. Dix-Lewis (Middlesex Regt.); June 16.

Stores Branch

Flight Lieut. P. J. Wiseman is transferred to Stores Branch for Accountant duties from General Duties Branch; May 5. Flight Lieut. C. A. Shaw, D.S.O., is placed on retired list on account of ill-health contracted in the Service, and is granted rank of Major; June 28.

Medical Service

Flying Officer R. Boog-Watson, M.B., D.P.H., to be Flight Lieut.; June 7. Capt. H. E. Hayes, Army Dental Surgeon, is granted a tempy. commn. on attachment to R.A.F.; June 16. (He will continue to receive emoluments from Army funds.)

Nursing Service

The following ladies are confirmed in their appts. as Staff Nurses:—Misses M. S. F. Stewart; Dec. 3, 1921. J. McLeod; Dec. 6, 1921.

Memorandum

Lieut. R. F. Berrill, R.F.A., relinquishes his temp. commn. on return to Army duty; July 16, 1918 (substituted for Gazette July 30, 1918).

Investigation of Aircraft Accidents

REGULATIONS for the investigation of accidents under Section 12 of the Air Navigation Act, 1920, have been made by the Secretary of State for Air, and have been placed on sale by H.M. Stationery Office. These Regulations will come into operation on July 12.

Since May, 1919, arrangements made by the Air Ministry with aircraft companies and the owners of aircraft have enabled this Department without statutory powers to conduct enquiries into accidents with the good will of the parties concerned. It was felt, however, that the conduct of such enquiries should ultimately be placed on a statutory basis in the same way as enquiries into accidents in other industries, notably those of shipping and railways, and accordingly power was taken in the Air Navigation Act, 1920, enabling the Secretary of State for Air to issue regulations for the investigation of accidents by air.

The regulations now issued are based upon three years' experience of the voluntary system which has hitherto existed, and their main features are as follows:—

- (1) Compulsory notification of accidents.
- (2) Statutory powers for preliminary investigation of accidents by an Inspector of Accidents appointed by the Secretary of State.
- (3) Statutory powers to order, if deemed necessary, a formal investigation by a person specially appointed by the Secretary of State.
- (4) Statutory authority for the publication of the whole or part of the report of an investigation.

A New Junkers Three-seater

A NEW Junkers monoplane has just been completed which appears to promise well. Although fitted with a Siemens engine of 60 h.p. only, it carries pilot and two passengers. It is rumoured that when the machine has been

Commercial Aviation in America

In an excerpt—issued by the Aeronautical Chamber of Commerce of America—from the 1922 Aircraft Year-Book which is published by the above body, some interesting facts are given as regards civil aviation in America. Of these, the following data showing the comparative figures for the years 1920 and 1921 are, perhaps, worthy of note:—

	1920.	1921.
Estimated number of aircraft in operation	1,000	1,200
Estimated total mileage	6,000,000	6,250,000–6,500,000
Operating companies reporting	88	125
Equipment of these companies	365–425	500–600
Mileage flown by these companies	3,136,550	*2,907,245
Number of passengers carried	115,163	122,512
Pounds of freight carried	41,390	123,227
Number of flights by operating companies	Unknown	130,736
Average duration of flights	Unknown	21 mins.
Average charge for short flights	\$12.50	\$9.00
Average charge per mile for inter-city flights	0.65	0.55
Average charge per pound for freight	Unknown	0.33
States in which operations were carried on	32	34
Air terminal facilities	128	146

(*Decrease explained by less free and more paid flights.)

thoroughly tested it will be built in quantities in either Sweden or Holland, although we see no reason why it should not be built in Germany, the present restrictions not prohibiting manufacture of machines complying with certain regulations.

PERSONALS

To be Married

The marriage arranged between HENRY MICHAEL MOODY, M.C., R.A.F., son of the Rev. Henry Moody, vicar of Welshampton and Rural Dean of Ellesmere, and Mrs. Moody, and AUSTIN ROBINA (BOBBIE), youngest daughter of Mr. and Mrs. C. A. HORN, of Adelaide, South Australia, and Beaumont, Jersey, will take place at St. Aubin's, Jersey, early in August.

The engagement is announced between Mr. B. de H. PEREIRA, B.A., LL.B., late R.A.F., of 131, St. James's Court, S.W. 1, only son of Mr. H. J. C. Pereira, K.C., and BARBARA, elder daughter of Mr. and Mrs. C. G. SYRETT, of Oakdene, Sydenham.

Killed

RONALD ST. CLAIR MCCLINTOCK, M.C., Flight-Lieutenant R.A.F., of Tresco, Birchington-on-Sea, who was killed on June 22 in a flying accident at Northolt, was the youngest son of Mr. and Mrs. Arthur McClintock, of Rathvinden, Leighlin Bridge.

All the World's Aircraft

JANE'S *All the World's Aircraft* for 1922 (12th edition), which is now obtainable, is, as in previous volumes, full of interesting and very useful information regarding aircraft and all appertaining thereto. Considering the almost hopeless nature of the task confronting one when trying to collect from various sources complete particulars of the world's aircraft, we are bound to admit that the information given in the book is remarkably complete and up to date.

Several changes in the arrangement of the 1922 volume have been made, and whereas previous issues appeared towards the end of the year, this time it makes its appearance much earlier. It is divided into four parts:—(A) The Progress of Aviation in the various Countries during the past Year; (B) The World's Aeroplanes; (C) The World's Engines; and (D) The World's Airships. In each section the countries are arranged alphabetically.

As before, it is edited and compiled by C. G. Grey, and is published by Sampson Low, Marston and Co., at £2 2s.

PUBLICATIONS RECEIVED

Advisory Committee for Aeronautics, Reports and Memoranda, No. 246. *Experiments on Model Airships*. By J. R. Pannell, N. R. Campbell and G. N. Pell. June–October, 1916. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 6s. 6d. net; by post, 6s. 8½d.

Aeronautical Research Committee: Internal Combustion Sub-Committee Reports—

No. 14. *An Investigation of Certain Spark Gaps for Magneto for the Air Board*. By C. C. Paterson, M.I.E.E., and N. R. Campbell, Sc.D. August, 1917. Price 6d. net. By post 6½d.

No. 19. *The Relationship Between Air Temperature and the Power of a Petrol Engine*. By A. H. Gibson, D.Sc. November, 1917. Price 4d. net. By post 6½d.

No. 21. *On the Synchronism of the Spark of a Magneto as Affected by the Method of Coupling*. By G. E. Baird, D.Sc. November, 1917. Price 6d. net. By post 6½d.

Report No. 130. *Oxygen Instruments*. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Report No. 144. *The Decay of a Simple Eddy*. By H. Bateman. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Abhandlungen aus dem Aerodynamischen Institut an der Technischen Hochschule Aachen, 1921 and 1922. Aerodynamischen Laboratorium Technische, Hochschule, Aachen, Germany.

Aeronautical Research Committee, Reports and Memoranda No. 681. *A Consideration of Airscrew Theory*. By A. Fage, A.R.C.Sc., and R. G. Howard, B.Sc. March, 1921. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 3s. net; by post 3s. 2½d.

Aeronautical Research Committee, Reports and Memoranda No. 761. (Ae. 22.) *Experimental Determination of Tailplane Characteristics*. By H. Glauert and I. L. Peatfield. July, 1921. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 9d. net; by post 10d.

Report on Benz Aero Engines (Bz 3bo (195 h.p.) and Bz 3bv (210 h.p.)). Air Ministry Publication 868. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 6s. net. By post 6s. 2½d.

Report on the Economic Situation of Denmark, to March, 1922. By R. M. Turner, O.B.E., Department of Overseas Trade. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 1s. 6d. net; by post, 1s. 7½d.

THE LONDON AERO-MODELS ASSOCIATION (The Society of Model Aeronautical Engineers.)

On Thursday, June 29, Mr. R. Reynolds read a very interesting paper on "The Handley Page Slotted Wing" before the members at Headquarters, 20, Great Windmill Street, Piccadilly, W. 1, Dr. A. P. Thurston presiding. It was followed by an excellent discussion by the members. A very hearty vote of thanks was passed to Mr. Reynolds and also to Dr. Thurston. The paper will be printed and circulated amongst the members in due course.

It is hoped that a good muster of members will attend on Thursday, the 6th inst., when suggestions for future competitions will be discussed.

The Committee hope that as many members as possible will enter the Competition for the FLIGHT Challenge Cup. If unable to enter for the Cup, members are asked to bring a model along for demonstration purposes.

General Rule No. 3 and Competition Rule No. 3 are specially drawn to the notice of members concerned. Competition Secretary, Mr. C. A. Rippon, 52, Fairbridge Road, Holloway, N. 19. Hon. Secretary, Mr. A. E. Jones, 48, Narcissus Road, West Hampstead, N.W. 6, to whom application for membership should be addressed.

Aircraft in the Naval Review

DURING the Naval Review in Torbay one of the exercises will be the bombing of the German cruiser Nürnberg by aircraft. It is understood that these experiments will take place today (July 6), but it appears doubtful if the results will be published.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motors. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1921

Published June 29, 1922

9,052. ZEPPELINWERK LINDAU GES and C. DORNIER. Alighting-gear. (160,788.)

Published July 6, 1922

7,224. H. LEITNER. Metal air-propellers. (181,110.)

7,687. VICKERS, LTD., Sir J. McKECHNIE and W. F. RABRIDGE. Means for indicating errors in direction of rotation of shafts. (181,129.)

9,453. C. J. STEWART, W. W. STAINER and L. BURN. Turning indicators. (181,164.)

12,049. J. F. O. DIDELOT. Vehicle capable of being moved vertically and horizontally in air and in water. (162,615.)

If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages iii and xvi).

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